The Positive Impact of Behavioral Change on Food Safety and Productivity

SEPTEMBER, 2013

sponsored by ALCHEMY

ABOUT THE STUDY. This study was independently designed and conducted by Robert Meyer to evaluate a methodology for sustainably changing the behaviors of front-line workers in the food industry. Mr. Meyer has more than 40 years of experience in the food industry. He has held a number of positions including food facility management and development of sustainable behavioral change and learning transfer models.

EXECUTIVE SUMMARY

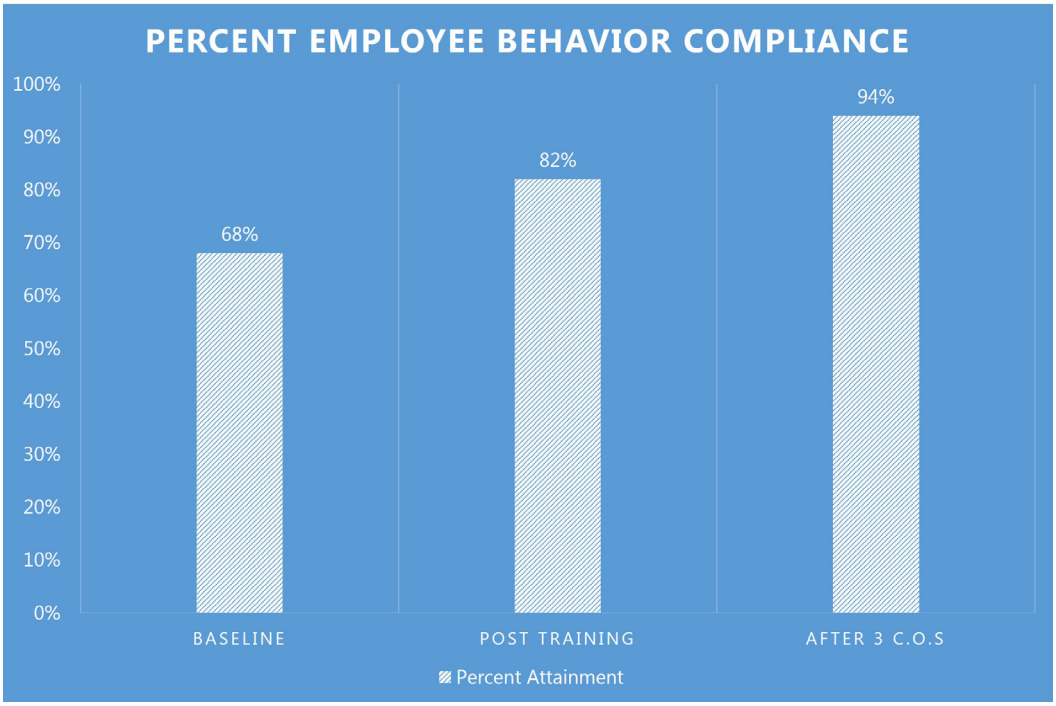
Food and workplace safety is a top priority for the food industry and its regulatory agencies. While training methods have improved safety compliance over the past decade, additional efforts and methodologies need to be applied, especially in light of recent product recalls, additional regulatory mandates and consumer concerns about the safety of their food supply. In addition to the focus on safety, companies seek continual improvements in productivity through reduction of waste, spoilage and other in-process production inefficiencies in order to maintain a profitable business in light of this challenging economy.

The purpose of this study was to determine if prescribed supervisory coaching coupled with effective training could drive employee performance among front-line food workers. The study was conducted at four U.S. food processing facilities and had three phases:

- Phase 1: Identifying the production process to be improved and then determining what standard should be used to measure effective performance.
- Phase 2: The identified standard was parsed into a sequence of process steps. Each step was then broken down into a sequence of effective behaviors.
- Phase 3: Supervisors conducted corrective observations (COs) using detailed compliance checklists. In cases of non-compliance, corrective actions were assigned.

Across the four separate facilities, the study measured compliance levels at pre-training, post-training, and following each CO (*Exhibit 1*). The average pre-training compliance rate was 68 percent. Post-training, compliance improved to 82 percent and after three COs, compliance increased to 94 percent.

Exhibit 1: Change in Food Worker Performance



The results indicate that the combination of effective training, corrective observations, and coaching can improve safety and productivity performance.

BACKGROUND

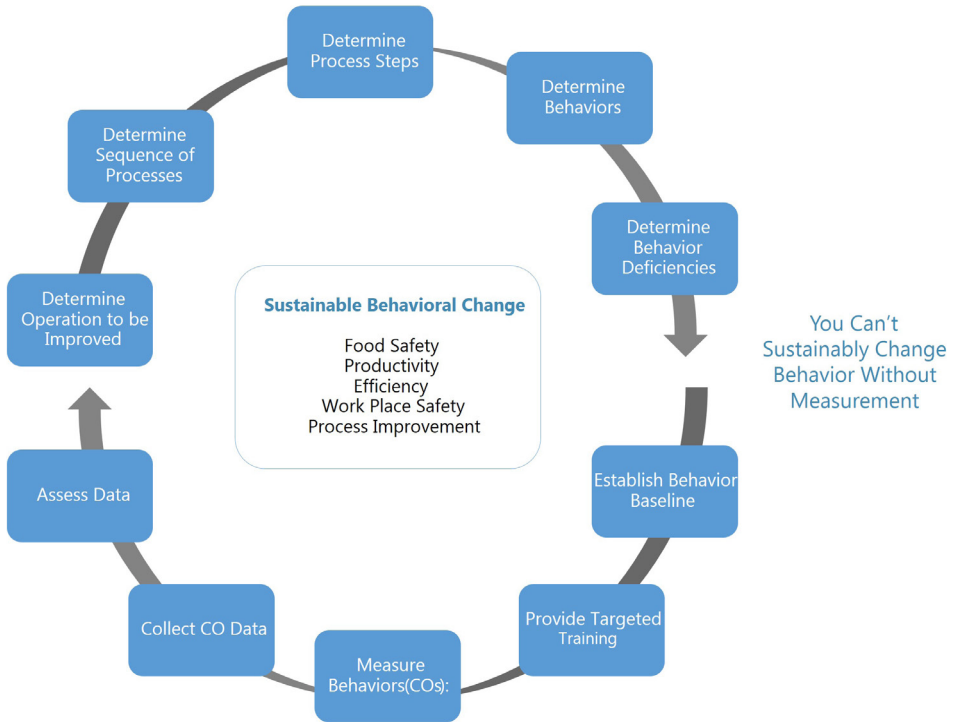
Despite the increased emphasis on food safety, there has been no appreciable decline in the number of food product recalls by the U.S. FDA. Pages on the agency's website displaying "Recalls, Market Withdrawals & Safety Alerts" in 2013 list more than 160 food product recalls stemming from such contamination issues such as salmonella, pathogens, listeria monocytogenes, novovirus, e.coli, and metal fragments.1

The U.S. Centers for Disease Control and Prevention (CDC) estimate that each year, 1 in 6 Americans (or 48 million people) become ill from foodborne illnesses, "128,000 people are hospitalized and 3,000 die."2 The growing response to the public threat from food safety lapses resulted in government legislation (e.g., Food Safety Modernization Act - FSMA) and stepped up enforcement and fines. Food safety is also recognized as a global problem because "foodborne and waterborne (diarrhea) diseases kill an estimated 2.2 million people annually, 1.9 million of them children…and food containing harmful levels of chemicals can cause serious health problems, including cancer," according to the World Health Organization in 2013.3

Safety, despite its overwhelming importance, is not the only concern for the industry. Food companies from farm to fork are seeking ways to improve productivity and reduce waste in order to improve their company's financial performance. A report published in 2007 for the Texas Workforce Commission by the Food Training Institute indicates that even a small improvement in worker productivity through training can have a significant impact on profitability.3

The study is based on the premise that a closed loop of effective training – combined with supervisory observations and coaching can significantly improve compliance (*Exhibit 2*).

Exhibit 2: Process for Employee Improvement



- The model consists of the following key steps:
- Deconstructing a particular process into a sequence of processes/steps.
- Determining the desired employee action/behavior at each step and identifying deficiencies.
- Observing, measuring and documenting the baseline level of behavior compliance.

- Training front-line employees on acceptable behaviors.
- Enabling supervisors to make "corrective observations" of individual employees.
- Providing employees with either real-time corrective action when they are not in compliance or positive reinforcement if fully compliant. Corrective actions are non-judgmental and non-punitive in order to focus on improvement.
- Repeating the CO process on a sustained basis to validate employee improvement.

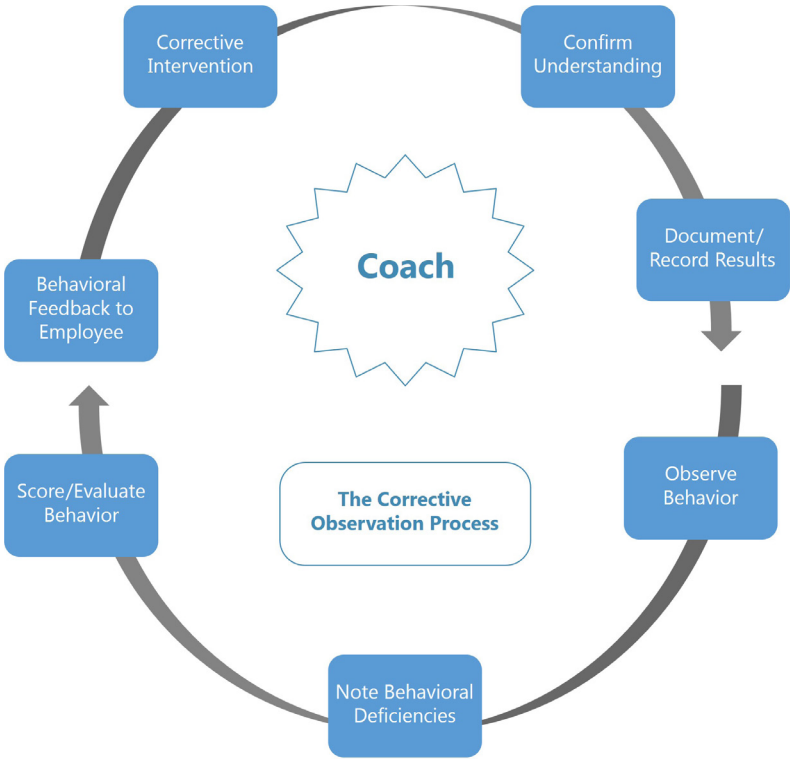
The study was conducted from November, 2011 to January, 2013 at four diverse food processing facilities with the support of the plant management teams:

- Soup/sauce plant (California, USA)— manufacturing company supplying a variety of soups and sauces through U.S. distribution to foodservice, retail and other manufacturers.
- Meat processing facility (Wisconsin, USA)—plant operated by a global supplier of a wide array of protein and baked goods items for foodservice and retail customers.
- Cheese/dairy operation (Wisconsin, USA)— small dairy utilizing its own bottling plant to supply a variety of dairy products to companies in multiple states.
- Meat production plant (Illinois, USA)—one of many worldwide manufacturing plants operated by a global supplier of an array of baked goods and protein items.

At each plant, the study director met with the study project team consisting of food safety, workplace safety and training personnel. The director and teams conducted facilitative exercises to identify the production process to be studied. Worker behavior at each facility was observed through the following process:

- Identification of a sequence of measurable behaviors.
- Comprehensive identification of possible deficiencies and documentation in a check list for each step of critical, measurable behaviors.
- Development of targeted training courses for each process.
- Training of supervisors for effective execution of the process.
- Establishment of pre-training baselines based on an average percentage of compliant behavior by each front-line worker.
- New, targeted training of employees for each desired behavior.
- Corrective observations and appropriate coaching (positive reinforcement and specific corrective actions) by supervisors (*Exhibit 3)*.
- Manual documentation and reporting of results.

Exhibit 3: The Corrective Observation Process



During the CO, supervisors documented specific behaviors on detailed behavioral observation sheets and checklists (*Exhibit 4*). The sheets list each step of the process along with a scoring system to note observed deficiencies.

Exhibit 4: Sample Hand Washing Process Corrective Observation Sheet

1.0 Hand Washing Process: Corrective Observation Sheet					
Code	**Step sequence**	**Code**	**Decencies**	**Deficiency Deduction**	**Actual Deduction**
1.1			**Wet hands and forearms thoroughly and apply soap**		
		1.1.1	Not wetting thoroughly enough	-10	
		1.1.2	Not wetting forearms at all	-10	
		1.1.3	Not using soap at all	-20	
		1.1.4	Not enough soap	-10	
		1.1.5	Not putting soap on forearms	-10	
				Total Deficiency Deductions	
				Total Step Score (100 minus total deductions)	
1.2			**Scrub hands and forearms for at least 15 second**		
		1.2.1	Not scrubbing at all	-20	
		1.2.2	Not scrubbing long enough	-10	
		1.2.3	Not scrubbing forearms	-20	
		1.2.4	Not scrubbing back of arms	-10	
				Total Deficiency Deductions	
				Total Step Score (100 minus total deductions)	
1.3			**Rinse hands and forearms thoroughly**		
		1.3.1	Not rinsing hands at all	-20	
		1.3.2	Not rinsing thoroughly-soap left	-10	
		1.3.3	Not rinsing forearms	-10	
				Total Deficiency Deductions	
				Total Step Score (100 minus total deductions)	
1.4			**Dry hands and forearms thoroughly**		
		1.4.1	Not drying with right method		
		1.4.2	Not drying thoroughly enough		
		1.4.3	Not drying both hands and forearms		
		1.4.4	Touching paper towel dispenser		
				Total Deficiency Deductions	
				Total Step Score (100 minus total deductions)	
1.5			**Use paper towel to open door**		
		1.5.1	Touching door or handle even while using paper	-10	
		1.5.2	Using just hand or other body parts to open door	-10	
				Total Deficiency Deductions	
				Total Step Score (100 minus total deductions)	

After a CO, the supervisor scored the employee's performance using an evaluation scale (*Exhibit 5*) and informed the employee of the score. The level of performance determined the supervisor's next course of action (e.g., employee recognition, demonstration of correct behavior, additional training).

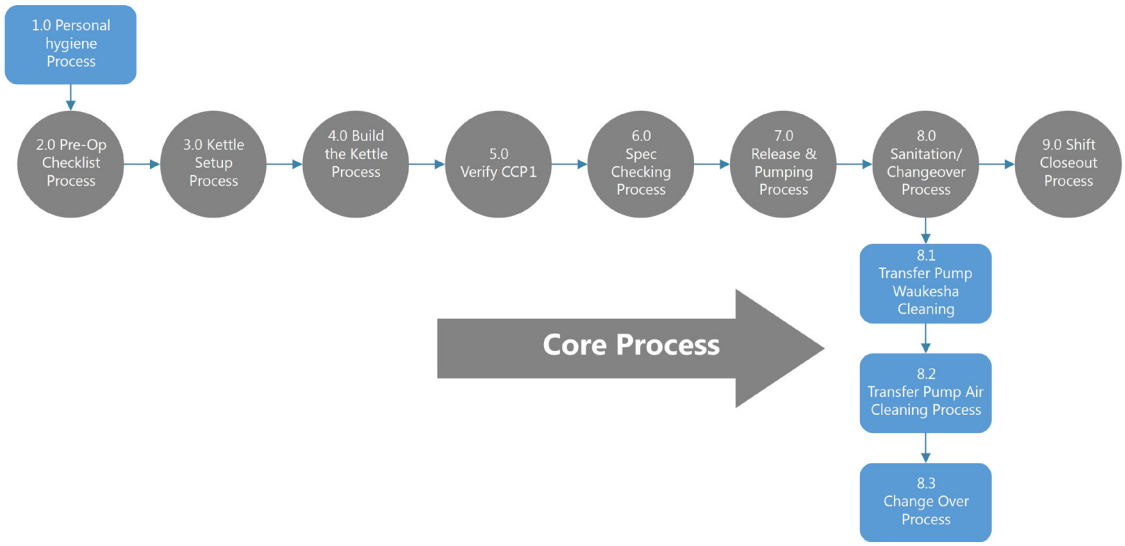
Exhibit 5: Sample CO Evaluation Scale

Corrective observation evaluation scale		
Level of performance	Scale	Intervention
Perfect: No improvement needed	95-100	Give recognition
Very strong: Small imprpvement needed	90-94	Give recognition & deeper knowing questions?
Strong: Some improvement needed	85-89	Coach & correct behavior & deep knowing questions?
Adequate: Improvement needed	80-84	Coach & demonstrate to correct behvior & Questions for understanding?
Average: Considerable improvement needed	75-79	All of the above repeated numerous times! Questions for understanding?
Fair: Substantial improvement needed	70-74	Retraining on the specific behavior
Weak: Trendemous improvement needed	50-69	Retraining on the whole process
Disaster: Start over	0-49	Intensive retraining on all processes of the operation.

SOUP & SAUCE PRODUCTION FACILITY (CALIFORNIA, USA)

At this facility, the study team chose to study the impact of training and corrective observation process on employee compliance with process controls of the kettle operation. The study measured the full kettle operation from ingredient staging through final cleaning and equipment sanitation. Nine discrete kettle operation steps were identified (*Exhibit 6*) and team selected step 4 (Kettle Build) as the most critical from an in-process hygiene perspective.

Exhibit 6: Exhibit 6 Kettle Operation Process



A process map of the Kettle Build process and desired worker behavior was developed (*Exhibit 7*) along with construction of a detailed corrective observation checklist (*Exhibit 8*).

Exhibit 7: Kettle Build Process Map

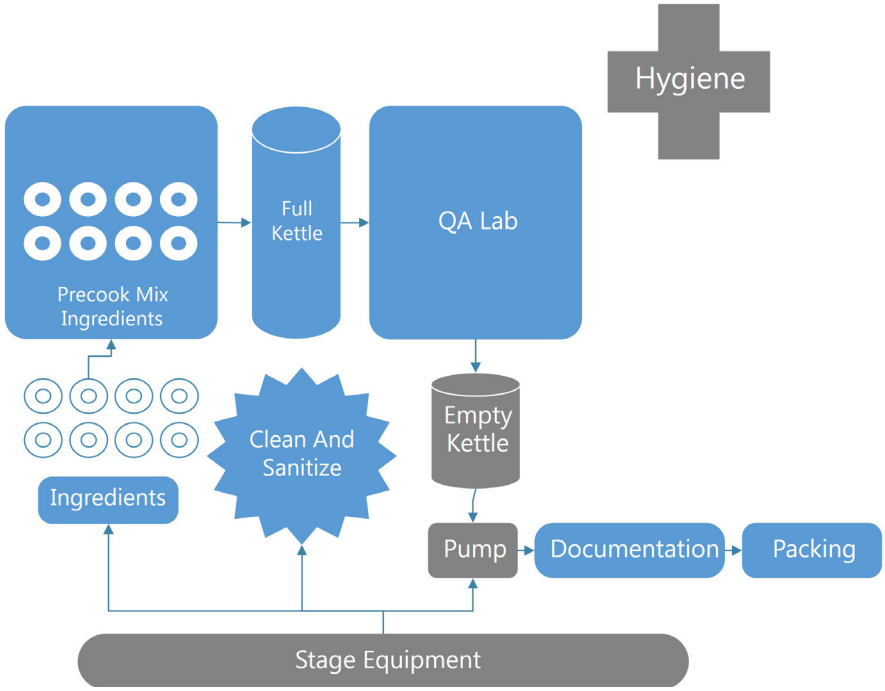


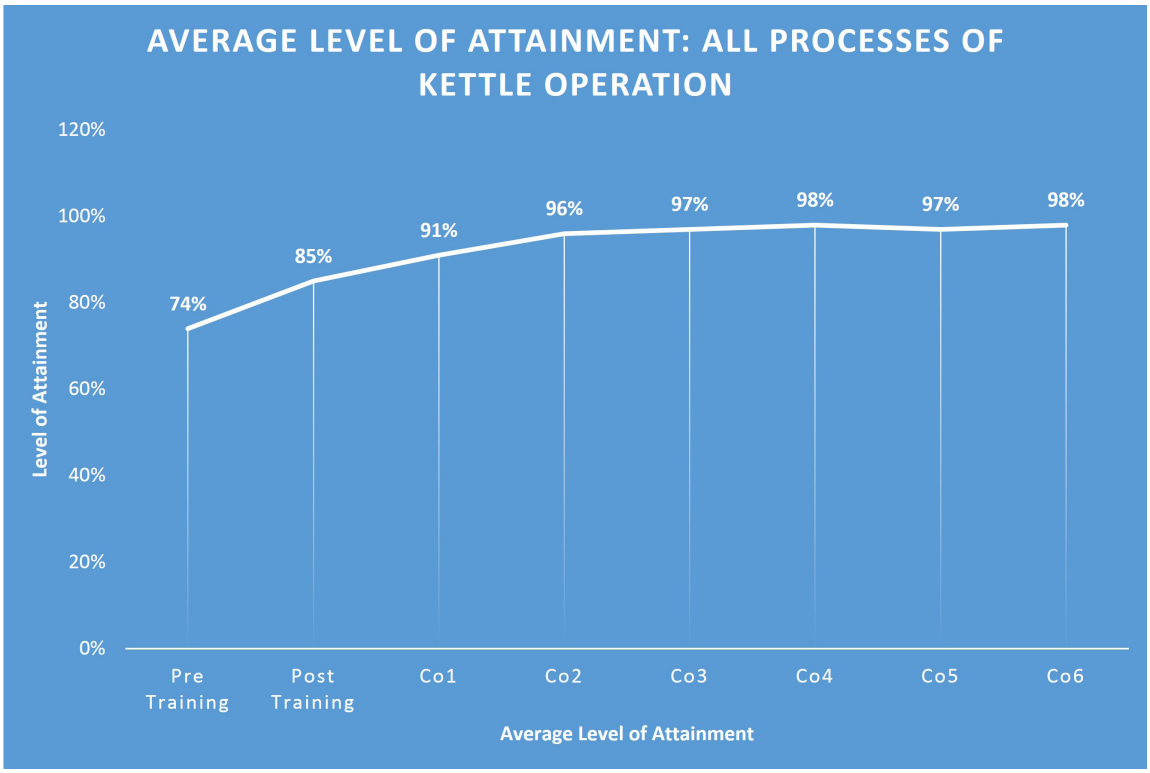
Exhibit 8: Kettle Corrective Observation Checklist

Build the Kettle & Corrective Observation Sheet]					
Code	**Sub Step Sequence**	**Code**	**Deficiencies**	**Deficiency Deduction**	**Score**
4.1	Confirm work order				
		4.1.1.1	Work order not confirmed at all	-20	
		4.1.1.2	Work order and recipe don't match	-10	
		4.1.1.3	Starting production with the wrong work order	-30	
				Score	100
4.2	Compare recipe with ingredients				
		4.2.1.1	Not comparing the recipes with the ingredients on the rack	-20	
		4.2.1.2	Not using labels in the confirmation process	-10	
		4.2.1.3	Not correcting any errors	-20	
		4.2.1.4	Starting production before correcting errors	-30	
				Score	100
4.3	Confirm quality				
		4.3.1.1	Not confirming the quality of all the ingredients	-20	
				Score	100
4.4	Confirm material				
		4.4.1.1	Not confirming the ingredient material to make sure it looks right	-20	
		4.4.1.2	Proceeding with production when the quality of ingredient material is not right	-20	
				Score	100
4.5	Confirm weights and qualities				
		4.5.1.1	Not properly confirming the weights and qualities of the ingredients	-20	
		4.5.1.2	Proceeding with production when weights and quantities are not correct	-20	
				Score	100
4.6	Confirm cut size				
		4.6.1.1	Cut size not confirmed	-20	
		4.6.1.2	Proceeding with production when cut size is not correct	-20	
				Score	100
4.7	Pre-cook operational check				
		4.7.1.1	Not checking the proper installation of piping	-20	
		4.7.1.2	Not reporting improper operations og giagators	-20	
		4.7.1.3	Operating kettle when there are known repairs needed to equipment	-40	
		4.7.2.1	Not checking for proper installation of piping	-20	
		4.7.2.1	Not fixing improperly installed piping	-20	
		4.7.3.1	Not making sure that all open ends of pipes have a blue plastic cap in place	-20	
		4.7.3.2	Not putting the blue plastic cap in place when defiency is discovered	-20	
		4.7.4.1	Failure to check the production schedule and properly make accomodations for the specific product being produced	-20	
		4.7.7.1	Failure to report and damage to the shift supervisor	-20	
				Score	100

RESULTS

The facility's pre-training baseline of employee behavior compliance was 74 percent—the highest baseline of the four plants studied. After process specific training, employee performance increased to 88 percent compliance. Following three corrective observations, compliance rose to 97 percent (*Exhibit 9*). Additional corrective observations documented behavior performance greater than 95 percent compliance through a series of four additional COs. It is notable that the continued observations may have played an important role in the 23 point gain from baseline to the third CO.

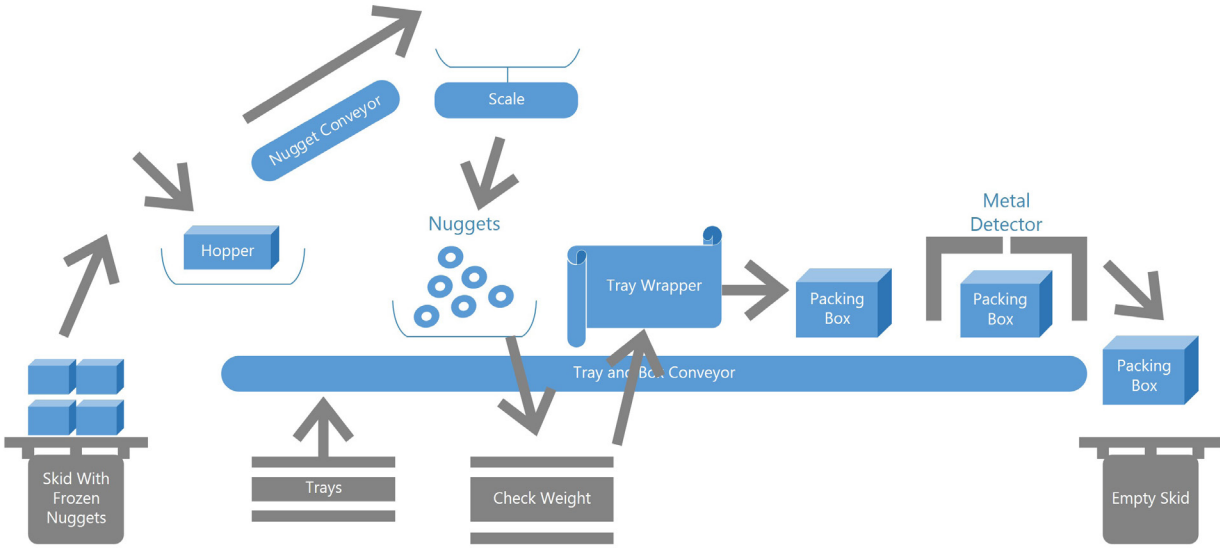
Exhibit 9: Average Level of Attainment from Kettle Operation



MEAT PROCESSING FACILITY (WISCONSIN, USA)

The project team determined that in-process hygiene would be the focus area for this processor of meat nuggets because it is critical to food safety compliance. The team chose the hopper filling process which includes opening boxes, dumping, checking weight, wrapping and packaging chicken nuggets along a production line (*Exhibit 10*).

Exhibit 10: Hopper Filling Process Steps



Once the process was mapped, the team also developed a detailed CO checklist of desired behaviors along each step of the hopper line (*Exhibit 11*).

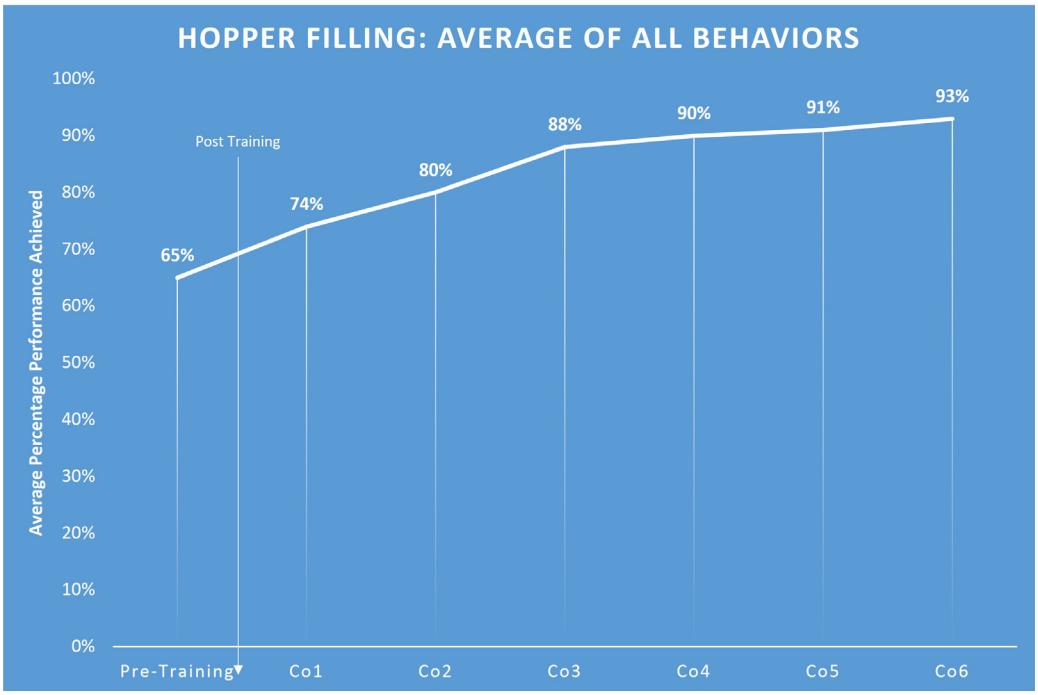
Exhibit 11: Hopper Filling Corrective Observation Checklist

3.0 Hopper Filling Process			
Code	Sub Step Sequence	Code	Deficiencies
3.1			Make sure hopper is free and clear of any debris
		3.1.1.1	Not checking the hopper at all
		3.1.1.2	Not finding all debris in hopper
		3.1.1.3	Not removing all debris from hopper
3.2			Right product available and documented
		3.2.1.1	Proceeding to process the wrong product
		3.2.1.2	Not getting the right product when the wrong product is on the scissors table
		3.2.2.1	Failure to fill out the form completely and accurately
		3.2.3.1	Failure to turn in the form at the right time and get in the right place
3.3			Move box to table
		3.3.1.1	Grabbing box with one hand
		3.3.1.2	Grabbing box in wrong place
		3.3.2.1	Failure to pull box toward you before lifting
		3.3.3.1	Failure to left before turning with box
		3.3.3.2	Jerking the box instead of a smooth motion
		3.3.3.3	Dropping the box
		3.3.4.1	Positioning the box so the label is not properly upright
3.4			Open box pull down liner
		3.4.1.1	Not peeling box enough so it pops open
		3.4.1.2	Having to hit box with fist to pop it open
		3.4.1.3	Not disposing of tape properly
		3.4.2.1	Not pulling flaps all the way down on the sides of the box
		3.4.3.1	Not pulling liner down at all
		3.4.3.2	Not using two hands to pull down liner
		3.4.3.3	Not pulling liner down enough
3.5			Lift box and dump into hopper
		3.5.1.1	Not adjusting hopper to the proper height
		3.5.2.1	Grabbing box with one hand
		3.5.3.1	Not lifting box close enough to hopper
		3.5.3.2	Touching the hopper with box or hands
		3.5.4.1	Not lifting the box high enough over hopper
		3.5.4.2	Not effectively dumping the box
		3.5.4.3	Touching the hopper with the box
		3.5.5.1	Not shaking the box to make sure it is empty
		3.5.5.2	Not fully empything the box
		3.5.6.1	Over filling the hopper
		3.5.6.2	Under filling the hopper
		3.5.7.1	Trying to catch any falling product
		3.5.7.2	Stepping on any product that has fallen
		3.5.7.3	Not kicing aside any product that has fallen

RESULTS

The pre-training baseline of employee behavior compliance was only 65 percent (*Exhibit 12*). Based on the process review, the project team, concluded that the hopper process was not optimally designed and proceeded to make significant changes. The targeted training that was provided included these new operational changes. After training, positive employee behaviors increased to 74 percent compliance and rose to 88 percent following three COs. Despite the significance of the 23 point improvement (65 percent to 88 percent), the team decided to continue the COs. After six COs, compliance further increased to 93 percent.

Exhibit 12: Summary Results from Meat Processing Plant Safety Behavior



CHEESE/DAIRY OPERATION (WISCONSIN, USA)

The facility processes specialty cheese which is distributed throughout the Midwest. The facility is not SQF certified, but the company desired to achieve certification given the growing demands from current customers and future plans to distribute product nationally. Management was concerned that with a relatively high turnover at the facility, significant improvement might be required to meet SQF standards. Employees had experienced little formal training at the beginning of the study. Much of the employee training had been on the job with some basic GMP (Good Manufacturing Practice) training provided during orientation.

The study team chose to focus on all aspects of GMPs and personal hygiene including:

- Hand washing procedures
- Entry/exit procedures
- Sickness/cuts/abrasion procedures
- Clothing and jewelry procedures
- Personal hygiene procedures
- Visitor and staff hygiene procedures

Once the process steps were identified, corrective observation checklists were developed (Exhibit 13: Sample Hand Washing Checklist).

Exhibit 13: Sample Hand Washing Corrective Observation Checklist

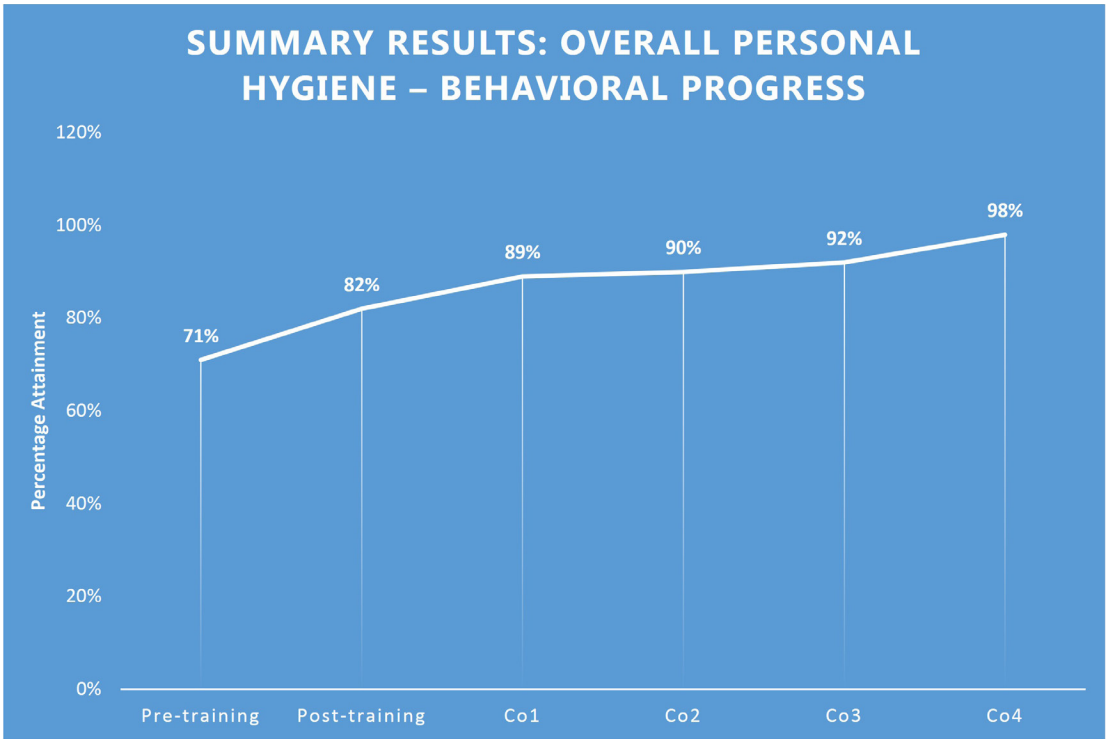
3.0 Hopper Filling Process					
Code	Sub Step Sequence	Code	Deficiencies	Deficiency Deduction	Score
3.1	Make sure hopper is free and clear of any debris				
		3.1.1.1	Not checking the hopper at all	-20	
		3.1.1.2	Not finding all debris in hopper	-10	
		3.1.1.3	Not removing all debris from hopper	-10	
				Score	100
3.2	Right product available and documented				
		3.2.1.1	Proceeding to process the wrong product	-20	
		3.2.1.2	Not getting the right product when the wrong product is on the scissors table	-20	
		3.2.2.1	Failure to fill out the form completely and accurately	-10	
		3.2.3.1	Failure to turn in the form at the right time and get in the right place	-10	
				Score	100
3.3	Move box to table				
		3.3.1.1	Grabbing box with one hand	-10	
		3.3.1.2	Grabbing box in wrong place	-10	
		3.3.2.1	Failure to pull box toward you before lifting	-10	
		3.3.3.1	Lafuire to left before turning with box	-10	
		3.3.3.2	Jerking the box instead of a smooth motion	-10	
		3.3.3.3	Dropping the box	-10	
		3.3.4.1	Positioning the box so the label is not properly upright	-20	
				Score	100
3.4	Open box pull down liner				
		3.4.1.1	Not peeling box enough so it pops open	-10	
		3.4.1.2	Having to hit box with fist to pop it open	-10	
		3.4.1.3	Not disposing of tape properly	-10	
		3.4.2.1	Not pulling flaps all the way down on the sides of the box	-10	
		3.4.3.1	Not pulling liner down at all	-10	
		3.4.3.2	Not using two hands to pull down liner	-10	
		3.4.3.3	Not pulling liner down enough	-10	
				Score	100
3.5	Lift box and dump into hopper				
		3.5.1.1	Not adjusting hopper to the proper height	-10	
		3.5.2.1	Grabbing box with one hand	-10	
		3.5.3.1	Not lifting box close enough to hopper	-10	
		3.5.3.2	Touching the hopper with box or hands	-20	
		3.5.4.1	Not lifting the box high enough over hopper	-20	
		3.5.4.2	Not effectively dumping the box	-20	
		3.5.4.3	Touching the hopper with the box	-10	
		3.5.5.1	Not shaking the box to make sure it is empty	-10	
		3.5.5.2	Not fully empything the box	-10	
		3.5.6.1	Over filling the hopper	-20	
		3.5.6.2	Under filling the hopper	-20	
		3.5.7.1	Trying to catch any falling product	-20	
		3.5.7.2	Stepping on any product that has fallen	-20	
		3.5.7.3	Not kicing aside any product that has fallen	-10	
				Score	100

All employees received targeted training on the GMPs and personal hygiene procedures. Supervisors conducted four corrective observations over the course of the study.

RESULTS

The pre-training (baseline) employee behavior compliance rate was 71 percent, a figure determined based on the absence of formal GMP or personal hygiene training provided to the employees prior to the study. After the targeted training was developed and delivered, the GMPs and personal hygiene compliance rates immediately increased to 82 percent. After three COs, the compliance rate improved to 92 percent. The facility conducted a fourth corrective observation and compliance improved to 98 percent (*Exhibit 14*).

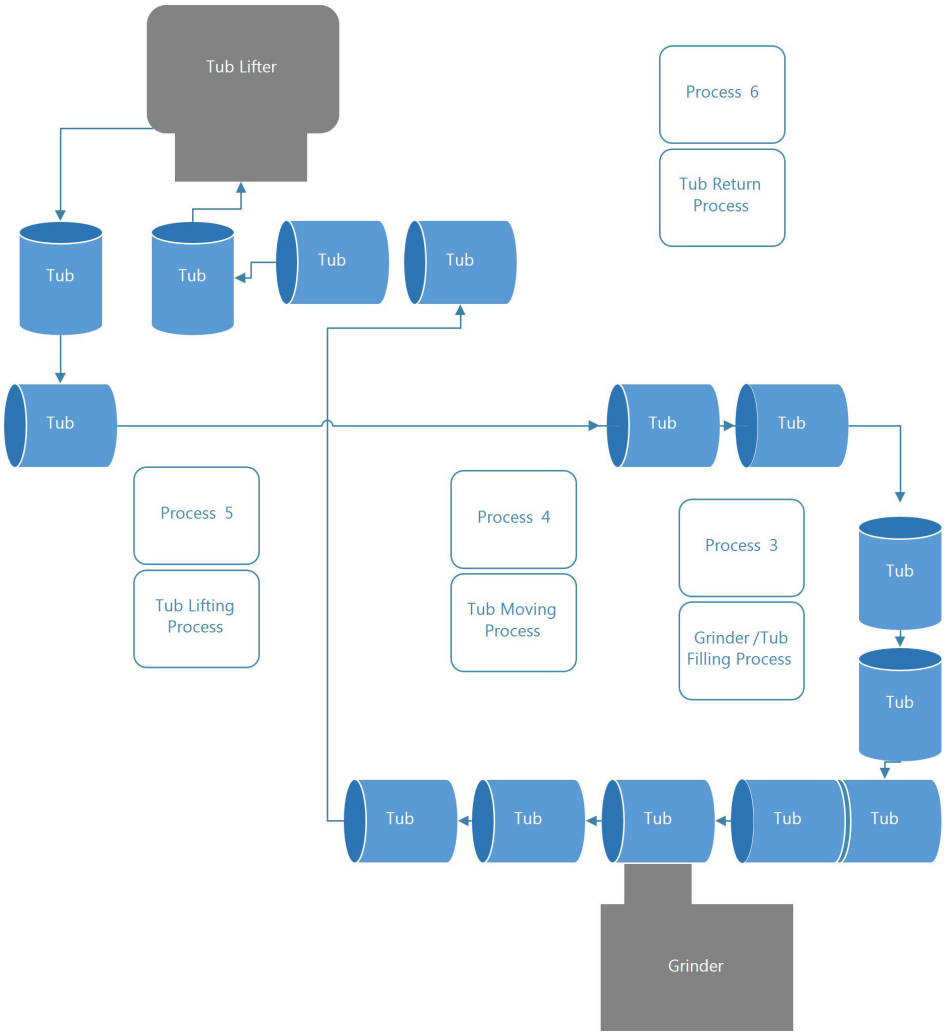
Exhibit 14: Summary Results from Cheese Facility Hygiene Behavior



MEAT PROCESSING PLANT (ILLINOIS, USA)

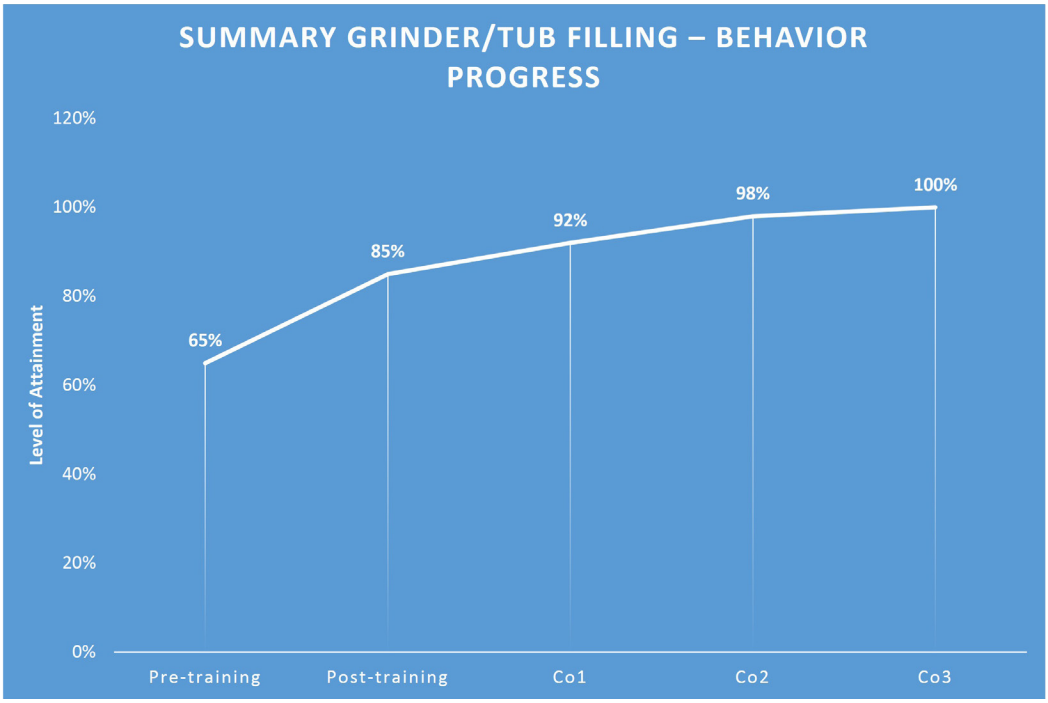
The study team at this meat processing facility wanted to define the impact of employee performance on workplace safety for the employees. Specifically, the team wanted to learn if the meat tub/grinding process (filling, tub moving, machine hookup, dumping and return) could be improved in order to minimize worker injuries (*Exhibit 15)*.

Exhibit 15: Tub/Grinder Process Flow



Once the process was charted and desired worker behaviors identified, the team developed a CO checklist (*Exhibit 16*).

Exhibit 16: Grinder/Tub Corrective Observation Checklist



RESULTS

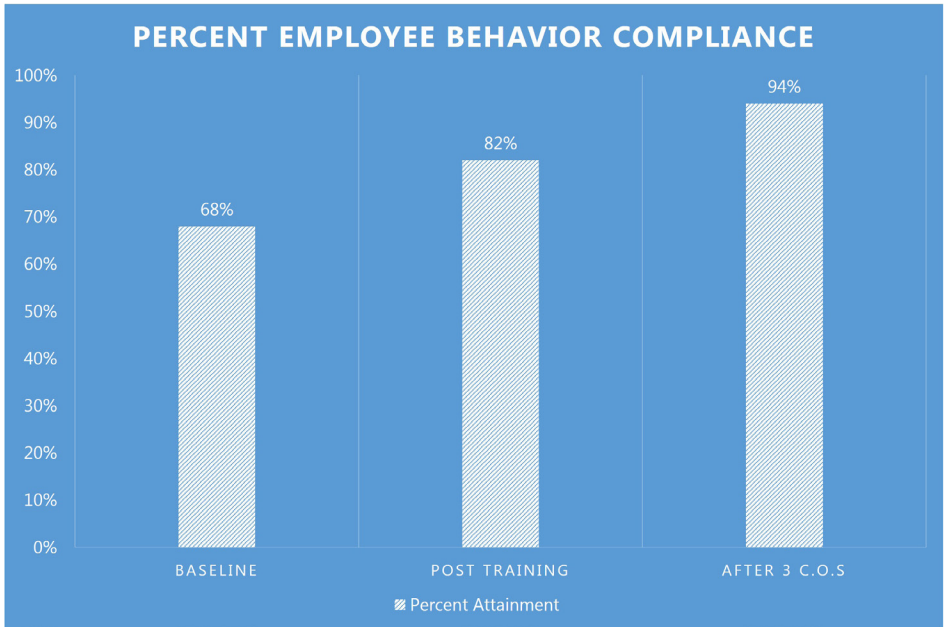
The pre-training baseline employee behavior compliance rate was set at 64 percent. Once training concluded, positive employee behaviors jumped by 21 points to 85 percent compliance. After three corrective observations, compliance reached 100 percent, which impressed the management team.

STUDY CONCLUSION AND IMPLICATIONS

The overall results of the study (*Exhibit 17*) indicate that employee compliance with standards and overall process results can be improved through a system of training, coaching and corrective observation. When the process was limited solely to targeted training, compliance climbed from 68 percent to 82 percent—a 14-point increase. After three COs, the average increase in compliance rose significantly to 94 percent.

The consistent improvement across all four facilities is a clear indication that training coupled with detailed corrective observations by front-line supervisors can drive behavior change, improve safety and increase productivity. It should be noted that all of these findings of improved compliance are consistent despite the diversity of operations, employee demographics, food safety or workplace safety processes, and geographic location of plants.

Exhibit 17: Change in Food Worker Performance



- The study also highlighted additional observations:
- Standards, operations and processes can be reduced to a sequence of behaviors.
- Measurement of behaviors can be credible and attainable.
- Employees can quickly evolve from average performance to superior performance.
- Supervisors can become effective coaches and subject matter experts.
- Systematic assessment of employee behaviors identifies possible product and employee safety risks
- Targeted training is effective in improving behavioral performance
- Sustained employee performance can only be accomplished through continuous training, coaching and corrective observations.
- Manual documentation and reporting would be meaningfully improved when administered through a technology platform.

The data indicates that companies can effectively assess their plant's processes and align employees with productivity and safety objectives through a process of targeted training, corrective observations and corrective actions.

ABOUT ALCHEMY SYSTEMS, LP

Alchemy Systems provides highly interactive training that use technology and media to educate food production workers. Its mission is to align employee safety and behavior in the food industry with companies' quality and safety commitments. The company's interactive training platform SISTEM® is used at 1,400 facilities worldwide.

FOOTNOTES

[1]Recalls, Market Withdrawals and Safety Alerts Search. U.S. Food and Drug Administration. http://www.fda.gov (August 2013).

[2]CDC Estimates of Foodborne Illness in the United States. http://www.cdc.gov/foodborneburden (2011).

[3]Ensuring Food Safety and Nutrition Security to Protect Consumer Health: 50 Years of the Codex Alimentarius Commission. World Health Organization. http://www.who.int/bulletin/volumes/91/7/13-125518/en/ (July 2013).

[4]Project Outcomes Survey 2007-Submitted to the Texas Workforce Commission. Hands of the Community (dba "Food Training Institute"). 2007.